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Analysis

Investing in Climate Change Adaptation: Motivations and Green Incentives in the Fiji Islands☆

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ABSTRACT

We investigate the interplay between individual's intrinsic motivation and green incentives on stated climate change adaptive behavior. Using experimental and survey data in the Fiji Islands, we find that intrinsic motivations favoring pro-environmental [beliefs] positively influence the intention to adapt. Moreover we find that green incentives crowd-in intrinsic pro-environmental motivations and further facilitate the uptake of adaptive investments. Demographic factors of ethnicity, occupation, participation in and access to credit also influence cognitive and behavioral constructs to varying degrees.

1. Introduction

With the proliferation of climate change impacts, the urgency of adaptation becomes ever more clear.[1] This is especially the case in the developing world where climate change poses a very real threat to development with the ability to reverse current progress in eliminating extreme poverty and exacerbating economic, political, and societal pressures (Watkins, 2007; IPCC, 2012; Fankhauser and Stern, 2016; Tol, 2018). Facilitating adaptive responses is therefore of paramount importance. In this paper we investigate the role of intrinsic motivation[2] and green incentives[3] on stated climate change adaptive investment behavior. More specifically, we study how internal motivating factors can interplay with green incentives in the context of adaptive investment to climate change by addressing two related research questions. First, *What are the intrinsic motivations of climate adaptive investments under different incentive conditions?* We address this question within the theoretical framework of the Theory of Planned Behavior (TPB). A key aspect of this theory is that intentions are the most proximal determinants of behavior. Intention in turn is influenced by activity specific attitudes, subjective norms (referring to significant others expectations regarding the behavior), and perceived behavioral control (referring to one's perceived ability to perform a given behavior). Second, *Do green incentives (extrinsic motivation) strengthen or undermine intrinsic motivations in relation to the uptake of climate adaptive investment*[4] *behavior?* Incentives, in this paper, are represented by environmental conditionality[5] and pecuniary reinforcements such as a lower loan interest rate for adaptive investments within a microloan scheme. We hypothesize that green incentives, if congruent with internal drivers of behavior, will crowd-in and thus strengthen intrinsic motivations thereby increasing the probability of selecting adaptive investments. The use of pecuniary incentives to affect behavior has come under scrutiny in recent decades (Kamenica, 2012). Monetary incentives have been found, at times, to be detrimental to inducing the desired behavior (Markowitz and Shariff, 2012; Frey and Oberholzer-Gee, 1997). More

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[1] For a recent review of the evolution of the economics of climate change, see Vale (2016).

[2] Intrinsic motivation is our internal driver of behavior. It reflects our internal beliefs.

[3] Refers to positively incentivizing agricultural practices that do not degrade natural ecosystems and are climate change adaptive. For instance this includes planting mangrove seedlings for mangrove regeneration and storm surge protection.

[4] Climate adaptive investments are those that increase resilience.

[5] Condition on the loan that relates to the fulfilment of certain environmental criteria

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recently, in fact, internal or psychological motives that are not driven by a monetary reward have been found to be powerful drivers of behavior.[6] Fig. 1 reports a simple diagram describing the process we aim to assess.

It should be emphasized that the adaptive response we seek to examine in this paper is not only a process that allows individuals to buffer against the private costs of climate change (Mendelsohn, 2000; Zilberman et al., 2012; Di Falco, 2014). It has, also, a public good connotation via its positive impact on the ecosystem.[7]

Our key results are as follows. We found that a positive set of intrinsic beliefs regarding the environment, favorably influenced self-reported behavioral intention. More importantly, we found that environmental conditionality on loans crowded-in intrinsic motivations and increased the probability of selecting climate change adaptive investments. Thus, green incentives, if congruent with internal drivers of behavior, could crowd-in intrinsic motivations. Demographic factors of ethnicity, occupation, participation in and access to credit also influenced cognitive and behavioral constructs to varying degrees.

To the best of our knowledge, these findings are novel and contribute to two general strands of literature. First and most obvious the growing literature on the barriers and drivers to adaptation to climate change (e.g., Deressa et al., 2009; Di Falco et al., 2011; Brick and Visser, 2015; Carleton and Hsiang, 2016). Unlike the existing literature this paper addresses the behavioral drivers of climate adaptive behavior and its interplay with financial incentives. The second strand of related literature is on green microfinance (Forcella and Hudon, 2016). As microloans form the basis of our experimental model our finding also expands this literature by providing evidence showing that microloans attached with environmental conditionality as an incentive mechanism can guide people towards making adaptive investments.

2. Background on Incentives and Intrinsic Motivations

Insights from cognitive neuropsychological studies have been able to map the neural circuitry that is activated in incentive-driven behavior. Such studies have shown that negative and positive incentives can result in slightly different activation pathways (Knutson et al., 2000). Studies have shown that a complex and often non-additive relationship exists between material and psychological incentives. Gardner and Stern (1996) for instance found that there is a possibility that creating large incentives could be detrimental to behavioral change in the long run by undermining people's intrinsic motives for action. Such incentives could potentially lead to a conditioned dependency on immediate rewards that may inhibit sustained and voluntary behavioral restraint when the reward schema is removed.

Contextual inference theory also attempts to explain incentive anomalies. This theory suggests that people take cues from their surrounding environment as to what the appropriate response should be when faced with uncertain stimuli – essentially converting environmental cues into heuristics for action (Kahneman, 2011; Kamenica, 2012). Kamenica (2012) suggests that less money and fewer options should be considered in incentive design. Smaller and simpler choice sets are more attractive to individuals than excessive choice sets because you can easily identify the utility of a decision. By offering too great a monetary incentive one may crowd-out intrinsic motivation as people become suspicious or complacent of the reward (Kamenica, 2008).

In their motivations based theory, Bénabou and Tirole (2006) show how intrinsic (or internal) motivations can be crowded-out by extrinsic ones (such as monetary rewards). Three different types of motivations are present in their utility function. These are: intrinsic, extrinsic and reputational motivations. Intrinsic motivations can be explained as our internal drive to perform an activity or task. Intrinsic motivations are reflective of our internal beliefs and its study has been related to cognitive dissonance theory which suggests from that people have an inner need to ensure that their beliefs and behaviors are consistent. Inconsistent or conflicting beliefs leads to disharmony, which people strive to avoid (Festinger, 1962). Intrinsic motivation does not depend on the rate of external rewards and punishments (incentives) but is driven by our own belief systems. Extrinsic motivation on the other hand comes from influences outside of the individual.

Both intrinsic and extrinsic motivations vary independently of each other; hence it is possible for extrinsic motivation to crowd-out intrinsic motivation through the over-justification effect.[8] Markowitz and Shariff (2012) note why this effect is important when looking at climate change adaptation. In a review of the literature regarding climate change and moral judgment, they found that an important barrier to public action on climate change is that it may often fail to activate our moral intuitions, which are important in forming relevant actions. They note that in using economic incentives as a mechanism to motivate behavior, you can create conflict between two values, namely: materialism and environmentalism. They also warn that the focus by policy makers on the framing of responses to climate change in economically beneficial terms can actively inhibit the development of intrinsic, non-materialist motives (such as being true to one's values, beliefs, virtue, and affiliation) to respond to the problem.

Reliance on extrinsic incentives to stop over harvesting can potentially crowd-out pre-existing intrinsic drivers of that behavior, which are formed by an individual's held beliefs. If and when the extrinsic incentive is removed, the motivation to continue performing that behavior for its own sake is also removed. Thus, as economic incentives and benefits for climate adaptive behavior changes over time, the focus on extrinsic motivators for individuals may be counterproductive in the long run. So the issue is that incentives may not be a sustainable solution for long run climate change adaptation and environmentally protective behavior. The final type of motivation in Bénabou and Tirole's (2006) utility function is that of reputational motivation which refers to concern for one's reputation. Reputational motivation varies with the public visibility of one's behavior.[9] If the behavior is invisible to others then it is assumed that reputational motivation is lacking. Their two player principle-agent game shows that the information the principle holds regarding the agent's ability or regarding the task at hand does have an effect on the efficacy of the extrinsic reward. Using Cooley's concept of the 'looking glass self', the agent uses the principal's perspective in order to learn about his or her ability. They show that successful incentives would provide the agent with hidden information about themselves that increases their confidence or perceived ability to perform a task (Bénabou and Tirole, 2006). By introducing extrinsic incentives (such as monetary rewards) we alter the motivation sphere in such a way that it can change the meaning attached to a behavior. For an intrinsically motivated person extrinsic incentives thus may conflict with the intrinsic in such a way that it negatively affects one's desire to engage in the behavior. The framing of the incentive in the private or public domain could in addition impact on one's moral reputation which further influences behavior. Bénabou and Tirole (2002) show that when an individual lacks self-confidence in their own ability to perform a task, then offering an economic reward can be counterproductive. His perception of his own ability may be further lowered by the incentive. Thus the likelihood of undertaking the task, when a

[6] See for instance Allcott (2011).

[7] It could be defined as 'green adaptation.' For adaptive responses that may fall somewhere in between the private and public good nature see Tompkins and Eakin, 2012.

[8] Which refers to the observation that an expected external incentive can decrease a person's intrinsic motivation to perform a task.

[9] It could be argued that the Grameen microfinance model has traditionally relied on the reputational aspect as an incentive against defaulting (McDonnell, 1999).

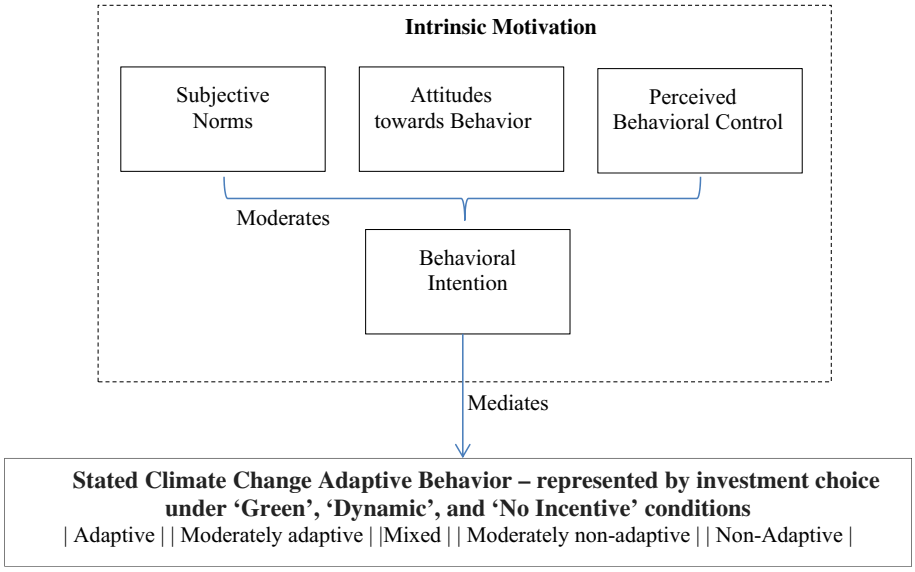
Intrinsic Motivation
Subjective Norms
Attitudes towards Behavior
Perceived Behavioral Control
Moderates
Behavioral Intention
Mediates
Stated Climate Change Adaptive Behavior – represented by investment choice under 'Green', 'Dynamic', and 'No Incentive' conditions
| Adaptive | | Moderately adaptive | |Mixed | | Moderately non-adaptive | | Non-Adaptive |

Fig. 1. Main processes.

person displays self-doubt, is compromised by a monetary reward.

3. Conceptual Background: The Theory of Planned Behavior

It is evident that the nature of incentives in eliciting the sought after behavior tends to draw upon complex cognitive functioning's. The salience of the incentive must be properly conceived of in order for it to be seen as a desirable reward structure thus provoking the crowding-out of the undesirable behavior and the uptake of that which is sought after. This indicates the importance of teasing apart the antecedents of behavior in order to better understand the efficacy of incentive structures. A natural starting point to behavioral antecedents is one's beliefs and attitudes. The standard assumption is that people behave in ways that are consistent to the beliefs and attitudes they hold (Nickerson, 2012). Whilst studies have shown that the nature of the relationship between attitudes, beliefs and behavior is a cloudy one at best,[10] predictive power has been shown to increase by measuring attitudes and behaviors on the same level of specificity, and by addressing constraints and facilities on behavior beyond one's control (Kaiser et al., 1999).

The Theory of Planned Behavior (TPB) takes this into consideration. It states that the constructs of Attitudes towards the behavior (A_B), Subjective Norms (SN; which are significant others approval or disapproval to perform the behavior) and Perceived Behavioral Control (PBC; which is the appraisal of one's own ability to perform a behavior) will lead to intention to perform said behavior. Intention in turn is hypothesized to be the most immediate predictor of behavior (Ajzen, 2002). Attitudes, subjective norms and perceived behavioral control can be seen as intrinsic motivators. Subjective norms can also be regarded as a reputational motivator as it indicates our reputational concerns through the importance placed on the views of referent others. A representation of the TPB can be conceived of as follows:

$$BI = A_B(W_1) + SN(W_2) + PBC(W_3)$$

The TPB has provided useful insights into conservation and pro-environmental behavior.[11][12] It is consistent with Bénabou and Tirole's motivation based theory and it provides an ideal set up to test the cognitive drivers of microloan investment behavior under differing incentive structures.

It has been shown that when used in conjunction with lab and field experiments, the TPB can be a useful predictor of behaviors. For instance Bamberg (2002) utilized field experiments to assess how intentions are translated to behavior. The behavior in question was buying organic food. Bamberg (2002) introduced differing levels of monetary incentives for purchasing organic food and found that higher incentives did in fact translate to action within the TPB paradigm.

3.1. Research Design and Method

The research was carried out on the Island of Viti-Levu in Fiji. A multi-stage sampling strategy was adopted. The first stage consisted of stratified sampling. Each strata indicated a geographic region defined as being close to or within fragile ecosystems in Viti-Levu. The specified areas were Koroyanitu protected area and highlands, Coral Coast marine protected area, Navua, Nausori, the Rewa delta and Colo-i-Suva reserve. The second stage consisted of simple random sampling within each strata to identify small rural communities. A total of 41 communities were identified in the study area, balancing iTaukei, or indigenous Fijian, villages with other Fijian communities. The resulting

[10] For instance, Gardner and Stern (1996) show that in cultures where the prevailing religious ideologies have explicit pro-environmental teachings, the ensuing pro-environmental beliefs and attitudes do not seem to affect pro-environmental behavior.

[11] Pro-environmental behavior as defined by Steg and Vlek (2009) is behavior that harms the environment as little as possible, and may even benefit the environment.

[12] See for instance, Lynne et al. (1995) analysis of the adoption of water conservation technology by Florida strawberry farmers. Whilst they found support for the TPB, they also state that the incorporation of financial variables to express actual behavioral control could increase the models explanatory power. For the case of water conservation technology adoption, Lynne et al. (1995) suggest that low PBC could in fact crowd-out behavior. As such governments need to balance control with incentives and moral suasion. Other studies have successfully applied the TPB to look at sustainable agricultural practices (Beedell and Rehman, 1999), curb-side recycling (Tonglet et al., 2004), the adoption of sustainable business practices by executives and managers (Mancha et al., 2014), and environmental behavior in the workplace (Greaves et al., 2013).

Description/Scale	
Ethnicity	0=Other 1=iTaukei (indigenous Fijian)
Gender	0=Male, 1=Female
Occupation	0=Other, 1=Farmer/Fisher
Status	0=Other, 1=Chief/ Village Head (used interchangeably)
Income	0=Y>F$10, 1= Y<F$10
Access to Credit	0=No, 1=Yes
Credit Participant	0=No, 1=Yes
Control (No information offered)	0=Yes, 1= No

Fig. 2. Demographic and contextual variables.

sample consisted of 205 respondents.

Whilst the majority of the population sampled identified their primary occupation as small farmers and fishers, the remaining were involved indirectly (either through family or supplementary income) in these occupations however identified their primary profession as other. The survey preceded the framed experiment and explored cognitive drivers and collected demographic and socioeconomic data (see Fig. 2).

To test our hypothesis, the instrument of microloans was used in the framed field experiment. There is growing interest in microfinance as an instrument for climate action and risk management. This is evident in the Fiji Clearing House for Risk Transfer, a UNFCCC repository of information on insurance and risk transfer, wherein we can find many examples of microcredit to mitigate and manage climate change risk.

For Small Island States, microfinance can act as a risk transfer mechanism for the rural and urban poor, whilst also alleviating the financial burden of adapting to climate change. In Fiji, the primary driver of microfinance is the Government. Currently, microloans in Fiji range in interest rates from: a low of 1.5% (HFC Microfinance Drua Account); mid interest rate of 19% (Bank of the South Pacific); to a higher rate of 25% (Microfinance West).

The psychological constructs of Attitudes Towards Conservation (ATC), Subjective Norms (SN), Perceived Behavioral Control (PBC) and Behavioral Intention (BI), were informed by the Theory of Planned Behavior (Ajzen, 1985). The final scales omitting those items removed for internal consistency and reliability, consisted of: a 9-item ATC scale ($\alpha = 0.73$); a 9-item SN scale ($\alpha = 0.87$); a 5-item PBC scale ($\alpha = 0.61$); and a 3-item BI Scale (BI; $\alpha = 0.90$). Each item was measured on a 5-point Likert scale. The items were reverse coded where appropriate and aggregated to create a summative scale which was coded to create a categorical variable with three categories to reflect high, medium, and low values as appropriate.

The items were constructed to ascertain people's protective beliefs, norms, and intentions regarding the environment. The sustainable use of natural resources, which the survey questions assess may be seen as divergent from the specificity argument of the Theory of Planned Behavior, however we argue that investment choice acts as a proxy to the 'end' behavior - the sustainable use and protection of the forest/river ecosystems. These were the natural ecosystems that were in proximity to the sampled population. In addition, this allowed us to control for response and acquiescence bias to a certain degree. If we asked questions relating to the intended use of the microloan for sustainable investments then during the choice experiment we risk diluting actual stated preference by artificially leading respondents to a choice.

3.2. Framed Experiment

The framed field experiment[13] was carried out following the administration of the surveys. The experiment was designed to analyze how preferences were affected when faced with different microloan incentive structures, which did or did not impose environmental conditions.

The design of the 'green' incentive condition was influenced by incentive theory, in particular looking at aspects of framing, contextual inference, and prospect theory.[14] The ensuing green incentive condition offered simpler and fewer choice sets with a small pecuniary reward. It also had a mandatory mangrove rehabilitation component to encourage biodiversity conservation. We also take note that the absolute subjective values of decisions under loss are greater than those under gain (Kahneman et al., 1991). Thus non-adaptive investments carry monetary penalties so that they elicit greater losses then the adaptive options. A high level summary of the experiment is presented in Fig. 3.

Participants were randomly assigned into a control group and a treatment group. In the latter, participants were presented with a climate change information leaflet, whilst the control group received no such information. The experiment started by asking the respondents to imagine themselves as a smallholder farmer with their plot being situated near a forest/river ecosystem in the region. They would be offered a microloan to invest in their farm.

Respondents started the experiment with a hypothetical loan of F $300[15] with a flat interest rate of 20% on the principal. This loan could be used to invest in one of three agricultural strategies, which are determined by their investment choice and was explained to them with the help of the information cards and mangrove and vertiver hedge leaflets. Investment choices are outlined in Fig. 4.

The experiment was conducted three times with three different incentive types. The incentive types determine the loan conditions; these were: no incentive, dynamic incentive, and green incentives. Under each incentive type there were two lending periods – so respondents could borrow twice under each incentive. The reason for having two periods was to examine whether there would be congruence between choices across periods with prior held attitudes and beliefs guiding the processing of information and subsequent behavior in a predictable manner. Investment choice differed in riskiness of returns, sustainability, and impact on ecosystems (see Table 1).

The method in which returns would be calculated is affected by the incentive type and random climate attributes. The latter was divided into good and bad seasons and was determined by a die roll. A roll of 1, 2 or 3 represented a good season (for instance: optimal soil fertility, sufficient rainfall, and optimal temperature for crop production). A roll of 4, 5 or 6 represented a bad season (for instance: extreme climate events such as erratic rainfall, drought, and increased severity of

[13] According to Harrison and List (2004) a framed field experiment is characterized by the use of non-standard subject pool (e.g., students are not used in the experiment) and field context.

[14] The concept of loss aversion in prospect theory (Tversky and Kahneman, 1986a, 1986b; Tversky and Kahneman, 1992) in conjunction with hyperbolic time discounting becomes relevant for environmental conservation where utility often is realized in the future. Tversky and Kahneman (1986a, 1986b) showed how loss aversion might be modified through creative framing of problem scenarios. For instance, through the use of emotive words one can evoke a desired for reaction. See also, Weber and Huettel (2008).

[15] In November 2012 the exchange rate was US$1 to F$1.7852

Experiment - High level summary

Note: the summary diagram below does not detail the concept of ecosystem effect

Incentive Type	Investment Choice	Loan Conditions
There are two lending periods under each incentive type, thus respondents play two rounds of the experiment for each Incentive Type	*Respondents selects an Investment choice for each of the two lending periods*	*Determined by and incentive type and investment choice*
No Incentive	Adaptive Mixed Non-Adaptive	• Interest ("i") = 20% • Loan maturity ("M") = 8 months • Required principal repayment ("P") =100%
Dynamic Incentive *i.e. missed payment ceases current loan so that further returns on the investment cannot be accrued for that loan period.*	Adaptive Mixed Non-Adaptive	• i = 20% • M = 8 months • P = 100% or $300
Green Incentive *Ecosystem effect impacts interest rate depending on Investment Choice (see column Loan Conditions)*	Adaptive	• i = 0% • M = 8 months • P = 90%
	Mixed	• i =24% • M = 8 months • P = 100%
	Non-Adaptive	• i = 25% • M = 6 months • P = 100%

Fig. 3. Framed field experiment high level summary.

Investment Choice

	Adaptive	Mixed	Non-Adaptive
Investment components	• Vertiver hedges • Organic fertilizer • Resilient seedlings • Mangrove seedlings for compulsory mangrove restoration	• Chemical fertilizer • Resilient seedlings • Mangrove seedlings for mangrove restoration	• Chemical fertilizer • Chemical pesticides • Resilient seedlings

Returns on Investment - Determined by Die Roll

Good Season	120	225	300
Bad Season	120	75	0

Ecosystem Effects

	6 (Good)	3 (Neutral)	0 (Bad)

Fig. 4. Investment choice.

Table 1
Matrix of investment choices across the two collection periods.

	Adaptive	Mixed	Non adaptive
Adaptive	1, 1	1, 2	1, 3
Mixed	2, 1	2, 2	2, 3
Non adaptive	3, 1	3, 2	3, 3

flooding). For example: the respondent chooses a non-adaptive investment; they roll the die and it falls on a 2. This tells them that it was a good season and they had an eventful harvest which yielded them F $300 return on their investment.

A score was assigned to translate the impact that the investment choice had on the ecosystem. The greater the score, the more positive the impact which would be rewarded by a lower interest rate under the green incentive condition.

The experiments were carried out on a decision sheet that was then

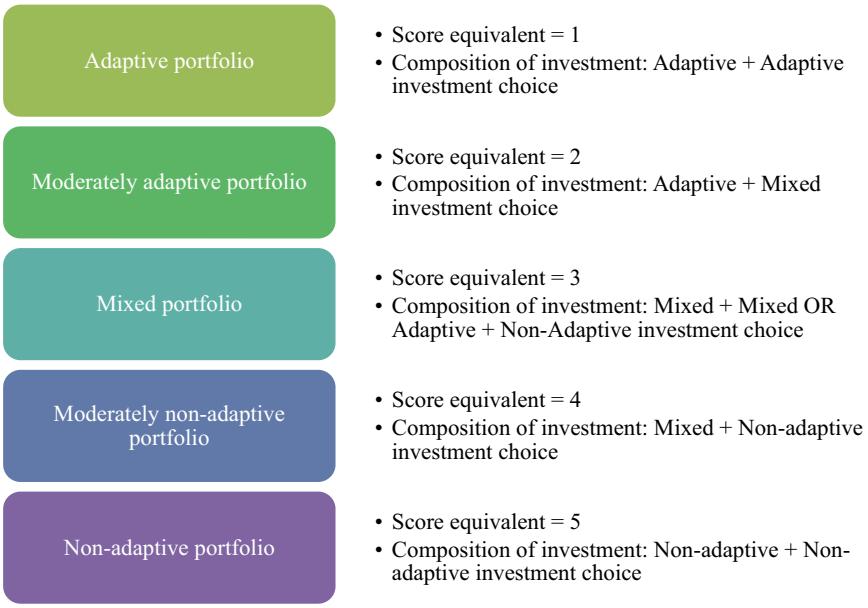
Adaptive portfolio
• Score equivalent = 1
• Composition of investment: Adaptive + Adaptive investment choice
Moderately adaptive portfolio
• Score equivalent = 2
• Composition of investment: Adaptive + Mixed investment choice
Mixed portfolio
• Score equivalent = 3
• Composition of investment: Mixed + Mixed OR Adaptive + Non-Adaptive investment choice
Moderately non-adaptive portfolio
• Score equivalent = 4
• Composition of investment: Mixed + Non-adaptive investment choice
Non-adaptive portfolio
• Score equivalent = 5
• Composition of investment: Non-adaptive + Non-adaptive investment choice

Fig. 5. Possible investment portfolios.

filled out by the researcher. An example for each different incentive type provided by the researcher to make sure that the experiment was fully understood. The respondents were presented with a calculator so as to decrease mental burden and to enable them to decide on the best investment strategy and calculate repayments however these proved to be difficult for respondents as such the researcher and research assistants would state returns.

The subsequent outcome variable for analysis was coded from 1 to 5, which combined the investment choices across the two collection periods. This coding represented all the possible combination of investments the respondent could have chosen as depicted in the following matrix and figure of investment portfolios (see Fig. 5):

3.3. Demographic and Contextual Factors

To better understand the determinants of stated adaptive investment behavior and its antecedents, several demographic and contextual factors were included in the TPB model. These include gender, social status (characterized as village head or chief[16]), ethnicity, income, prior and current microcredit participation. Demographic and contextual factors which may influence behavior and which have been explored in the TPB framework are attributes such as age, gender, religion, and income to name a few. For instance, in a study looking at environmental behavior in youth; gender, income, education and religious beliefs did not make a considerable impact on their environmental attitudes, behavioral intentions, and subsequent behavior (Niaura, 2013). However beyond the domains of the TPB, there has been much research to support the hypothesis that women are more inclined to environmentally protective behaviors. It has been argued that women have a special relationship with nature, and are particularly altruistic and caring in their environmental management (Jackson, 1993). Indeed in the Global South women have a distinct role in: the management of plants and animals in forests, drylands, wetlands and agriculture; in collecting water, fuel and fodder for domestic use and income generation; and in overseeing land and water resources. The extensive experience of women in the sustainable use of resources has included them in the climate change, and environmental conservation agenda as key actors of positive change (Meena, 1992; Pearson, 2000; Dankelman, 2002; Merchant, 2014; Vernooy, 2015).

Similarly indigenous communities are often in possession of rich cultural heritages and traditional ecological knowledge, which has been passed down from generation to generation on the sustainable use of resources (Cairns, 2015). In the pacific this is evident in the traditional practices around marine conservation. Restricted areas are commonplace as a traditional, and sustainable harvesting and gathering methods (for instance through the use of line fishing, hand nets, bare handed catching, and vono (a method of fishing through the creation of an inshore trap) (Kittinger, 2013).

Decisions affecting the management of the qoli qoli (traditionally defined fishing areas) and vanua (land-sea estate) are led by the clan chief. The clan chief in Fiji is seen as the supreme guardian of the village's parcel of land, waters, resources and resident indigenous people (Mühlig-Hofmann, 2007). It is this status as steward and guardian that makes us hypothesize that village heads may be more inclined to make decisions which are environmentally protective (see Table 2).

In addition we look at income, access to credit and current microloans as factors that influence behavior. Semenza et al. (2008) showed that people with lower income had greater concern regarding climate change. This could be because of the additional risk that climate change poses on their livelihoods. Whilst Grothmann (Grothmann and Patt, 2005) found that the level of income had no significant explanatory power for adaptation behavior. Other studies that investigate the impact of income on the adoption of climate change adaptive behaviors have found a positive correlation between income and behavioral uptake (Franzel, 1999). It could be that higher income farmers may be less risk averse, have better information access, and a longer term planning horizon (Deressa et al., 2009). In addition, we include access to credit and current microcredit participation as factors which may positively predict subsequent adaptive stated investment behavior as studies have shown that access to microcredit removes barriers to climate change adaptation in farmers (Bryan et al., 2009; Hassan and Nhemachena, 2008; Below et al., 2012). It has also been argued that microfinance services can enable the creation of livelihood assets base through direct and indirect (such as education and training) income effects, and non-pecuniary motivational effects (for instance from stronger social

[16] There are different chiefly ranks which have not been distinguished in this paper. The terms village head and chief are used interchangeably. Village heads represent the interest of the clan chief. Prior to conducting research within the selected village, permission needs to be sought from and a small offering (termed sevusevu) made to the village head.

Table 2
Descriptives of demographic and contextual variables.

	Mean	sd	Min	Max	Frequency	
					0	1
Access to credit	0.717	0.444	0	1	124	81
Current microloan	0.2	0.405	0	1	163	42
Access to insurance	0.14	0.349	0	1	176	29
Access to savings	0.45	0.499	0	1	112	93
Female	0.424	0.495	0	1	118	87
Farmer/fisher	0.776	0.418	0	1	46	159
iTaukei	0.751	0.433	0	1	51	154
Chief	0.073	0.261	0	1	190	15
Y < 10	0.356	0.48	0	1	132	73
Household size	5.2	2.265	1	13		
Age	41.6	13.186	19	83		

networks and increased confidence) which can make farmers more resilient to shocks and enable their capability to take on adaptive behaviors (Hammill et al., 2008).

3.4. Empirical Method

The empirical method employed was that of Path analysis which was clustered at the village level and specified using Mplus Version 6 software (Muthén and Muthén, 2011). Using a Weighted Means and Variance Estimator (WLSMV), Mplus estimates probit and linear regression coefficients, with the former being estimated for categorical outcomes. The WLSMV estimator is a robust method for categorical data. It uses a diagonal weight matrix, robust standard errors and mean and variance adjusted χ^2 test statistic (Finney and DiStefano, 2006). This method has also been shown to be sufficient for medium sized models with sample sizes between 150 and 200 (Brown, 2006) as is the case with the present study.

The Path model can be written as follows:

3.4.1. Equation - 1

$$Y1(Attitudes) = \alpha + \gamma_{11}\, Occupation + \gamma_{12}\, Gender + \gamma_{13}\, Ethnicity + \gamma_{14}\, Income + \epsilon_1$$

$$Y2(Subjective\ Norms) = \alpha + \gamma_{21}\, Occupation + \gamma_{22}\, Gender + \gamma_{23}\, Ethnicity + \gamma_{24}\, Income + \epsilon_3$$

$$Y3(Perceived\ Behavioural\ Control) = \alpha + \gamma_{31}\, Occupation + \gamma_{32}\, Gender + \gamma_{33}\, Ethnicity + \gamma_{34}\, Income + \epsilon_2$$

$$Y4(Behavioural\ Intention) = \alpha + \beta Attitudes + \beta Subjective\ Norms + \beta Perceived\ Behavioural\ Control + \zeta_1$$

$$U_1(No\ Incentive) = \alpha + \beta_2 Behavioural\ Intention + \beta_{21} Perceived\ Behavioural\ Control + \gamma_{41}\, Control\ (No\ Information) + \gamma_{42}\, Occupation + \gamma_{43}\, Gender + \gamma_{44}\, Ethnicity + \gamma_{45}\, Income + \gamma_{46}\, Prior\ Microcredit\ Participation + \gamma_{47} Current\ Microloan + \zeta_2$$

$$U_2(Dynamic\ Incentive) = \alpha + \beta_3 Behavioural\ Intention + \beta_{22} Perceived\ Behavioural\ Control + \gamma_{51}\, Control\ (No\ Information) + \gamma_{52}\, Occupation + \gamma_{53}\, Gender + \gamma_{54}\, Ethnicity + \gamma_{55}\, Income + \gamma_{56}\, Prior\ Microcredit\ Participation + \gamma_{57} Current\ Microloan + \zeta_3$$

$$U_3(Green\ Incentive) = \alpha + \beta_1 Behavioural\ Intention + \beta_{23} Perceived\ Behavioural\ Control + \gamma_{61}\, Control\ (No\ Information) + \gamma_{62}\, Occupation + \gamma_{63}\, Gender + \gamma_{64}\, Ethnicity + \gamma_{65}\, Income + \gamma_{66}\, Prior\ Microcredit\ Participation + \gamma_{67} Current\ Microloan + \zeta_4$$

The predicted probability of investment choice was given as:

3.4.2. Equation - 2

$$Pr(U = 1 \mid x_i) = \Phi(\tau_1 - b_1x_2 - b_2x_2...)$$

$$Pr(U = 2 \mid x_i) = \Phi(\tau_2 - b_1x_2 - b_2x_2...) - \Phi(\tau_1 - b_1x_2 - b_2x_2...)$$

$$Pr(U = 3 \mid x_i) = \Phi(\tau_3 - b_1x_2 - b_2x_2...) - \Phi(\tau_2 - b_1x_2 - b_2x_2...)$$

$$Pr(U = 4 \mid x_i) = \Phi(\tau_4 - b_1x_2 - b_2x_2...) - \Phi(\tau_3 - b_1x_2 - b_2x_2...)$$

$$Pr(U = 5 \mid x_i) = \Phi(-\tau_4 + b_1x_2 + b_2x_2...)$$

where ϕ is the cumulative normal distribution, τ is the threshold which in Mplus is the inverse of the intercept, b is the unstandardised coefficient. And recalling that investment choice was:

1) Adaptive portfolio
2) Moderately adaptive portfolio
3) Mixed portfolio
4) Moderately non-adaptive portfolio
5) Non-Adaptive portfolio

4. Results

The survey and framed experiment was composed of a total of 205 residents living in or near six fragile ecosystems in Viti-Levu. 17 communities were sampled. The sample population consisted of 75.1% iTaukei (indigenous Fijians), 24.9% Indo-Fijians, 42.4% females and 57.6% males. The average respondent was 41.6 years old with a range with 19 and 83 years of age. On average, they lived in households consisting of five people and generally were the head of the household[17] (50.7%). The main occupation was farming (45.9%), followed by fishing (31.7%) and the remainder (22.4%) of respondents were in other forms of employment. 35.61% of respondents earned between F $0 and less than F$10 a day. 50.2% earned between F$11 and F$20 a day and the remaining 14.1% earned over $21 a day. In terms of education, 2.9% of the sampled population had no schooling, 18.5% went through some primary school, 16.1% completed primary school, 31.7% went through some secondary schooling, 24.9% completed secondary school, 2% went through a literacy campaign and the remaining 3.9% were in or had completed tertiary education.

Regarding access to microcredit, 20.49% of respondents had no access to microcredit. 39.51% of respondents were microcredit participants. Only 14% of people sampled had access to insurance, whilst 45.36% had access to savings.

Frequency distribution of investment choice across periods and

[17] Here household head represents the household reference person

Table 3
Frequency distribution of investment choice.

Incentive type & period	Adaptive	%	Mixed	%	Non-adaptive	%
None period 1	119	58	69	33.7	17	8.3
None period 2	91	44.4	64	31.2	50	24.4
Dynamic period 1	85	41.5	71	34.6	49	23.9
Dynamic period 2	84	41.0	69	33.7	52	25.4
Green period 1	117	57.1	66	32.2	22	10.7
Green period 2	122	59.5	43	21.0	40	19.5

incentives types revealed that the adaptive investment was the most popular option (Table 3). People were opting for the adaptive investments most in the green incentive conditions, followed by the no incentive conditions.

We also evaluated whether the different conditions significantly differed from each other by way of a likelihood ratio chi square goodness of fit test. The null hypotheses that there was no significant difference between conditions was rejected, with moderate association between the conditions (No Incentive * Green Incentive: $\chi^2(16)$ 76.808, p = 0.001; Cramer's V = 0.338, p = 0.001; Green Incentive * Dynamic Incentive: $\chi^2(16) = 79.256$, p = 0.001; Cramer's V = 0.294, p = 0.001; Dynamic Incentive * No Incentive: $\chi^2(16)$ 61.545, p = 0.001; Cramer's V = 0.274, p = 0.001). We also saw that the treatment group, wherein respondents were in receipt of climate change information, did significantly differ from the control group in the dynamic and green incentive conditions, with moderate association between the conditions (Fig. 6).

4.1. Path Analysis

The direct effect of perceived behavioral control to stated behavior was constrained for parsimony and fitting propensity. The unconstrained model had poor fit statistics (RMSEA = 0.074, CFI = 0.886). The constrained model had excellent fit statistics (RMSEA = 0.03, CFI = 0.966). The RMSEA tells us that we can reject our null hypothesis of a poor fit of the data to the model, whilst the CFI tells us that 96.6% of the covariation in the data can be explained by our model. The theoretical model as expressed by our path analysis is represented in Fig. 7. The path coefficients and probabilities are represented in Tables 4 to 7.

The results were in line with the theoretical model. Intention was significantly and positively predicted by attitudes (B = 0.224, p = 0.080), subjective norms (B = 0.393, p = 0.036), and perceived behavioral control (B = 0.404, p = 0.016). When attitudes were positive and all other predictor variables were held at their mean, the probability of moderately positive intentions were 0.952 and positive intentions were 0.991. Similarly positive subjective norms saw a 0.812 probability of positive intentions, whilst perceived behavioral control saw a 0.707 probability of moderately positive and a 0.99 probability of positive intentions.

Attitudes, subjective norms and perceived behavioral control were positively and significantly influenced by ethnicity, with iTaukei having a 0.630 probability of positive attitudes, a 0.995 probability of positive subjective norms, and a 0.904 probability of positive perceived behavioral control. In addition village heads, and being female positively and significantly influenced behavioral control with a probability of positive behavioral control being 0.901 and 0.890 respectively. Income increased the probability of negative (0.408) and neutral (0.959) attitudes.

In the *no incentive condition*, holding all other variables constant, we see that iTaukei were more likely to choose adaptive portfolios over non-adaptive with a probability difference of 0.291 between an entirely adaptive and an entirely non-adaptive portfolio. Similarly having a current microloan increased the probability of choosing an adaptive portfolio (probability difference of 0.222 between choosing an adaptive over a non-adaptive portfolio).

In the *dynamic incentive condition*, holding all other variables constant, the probability of adaptive and moderately positive investment choices increased for iTaukei (B = −0.045, p ≤ 0.001; Predicted probability of an adaptive portfolio = 0.356 compared to 0.002 for non-adaptive) and by having an existing microloan (B = −0.179, p = 0.01; predicted probability of adaptive portfolio = 0.120 compared to 0.017 for non-adaptive). Farmers and fisher folk also were more inclined towards adaptive (0.473) over non-adaptive investment portfolios (0.001).

The control treatment (B = 0.21, p = 0.006), income (B = 0.062, p = 0.019) and access to credit (B = 0.0159, p = 0.006) significantly increased the probability of choosing non-adaptive portfolios with the moderately non-adaptive investment portfolio being the most popular choice with a probability of 0.558, 0.838, and 0.567 respectively.

In the *green incentive condition*, holding all other variables constant, investment choice was significantly mediated by behavioral intention (B = −0.187, p = 0.022), ethnicity (iTaukei; B = −0.525, p ≤ 0.001), the treatment group (B = 0.241, p = 0.027), and status as chief (B = 0.101, p = 0.067). With positive behavioral intention the

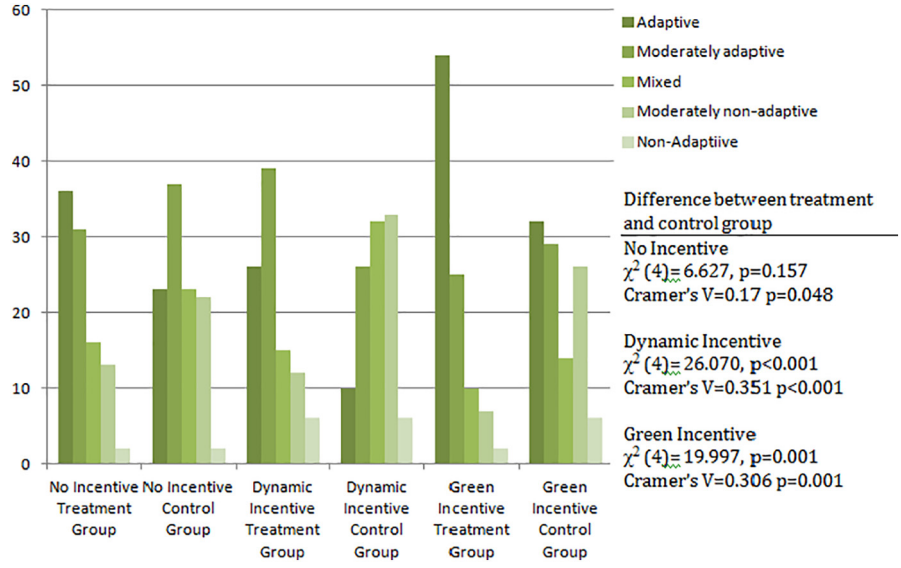

Fig. 6. Incentive choice across treatments and conditions.

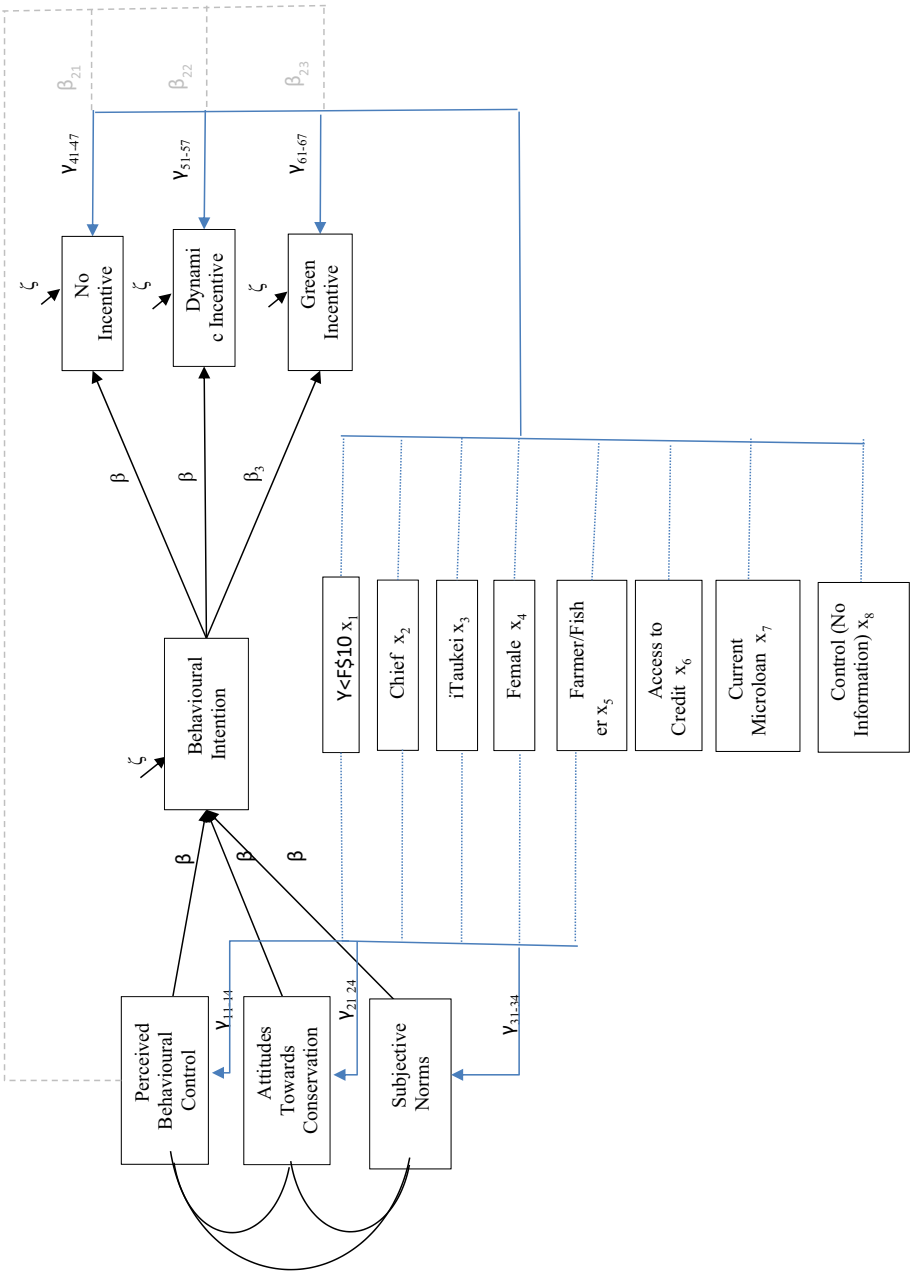

Fig. 7. Path model.

predicted probability of a solely adaptive portfolio was 0.346 in contrast to a probability of 0.012 for an entirely non-adaptive portfolio. For iTaukei the probability of choosing an adaptive portfolio was 0.573, compared to 0.002 for non-adaptive. As in the dynamic incentive condition, farmers and fisher folk also were more inclined towards adaptive (0.771) over non-adaptive investment portfolios (0).

In contrast, being in the control group, and societal status (namely being village head) inclined people towards more non-adaptive portfolios. In the control group the probability of choosing an adaptive portfolio was 0.065, whilst it was 0.125 for non-adaptive. Similarly, for village heads the probability of adaptive loan was lower at 0.061 than for non-adaptive (0.131).

We found that the different incentive conditions positively covaried with each other, as did the moderating constructs of the Theory of Planned Behavior.

As the investment portfolios were coded with 1 being adaptive and 5 non-adaptive, the negative correlation of the incentive conditions with the constructs of the Theory of Planned Behavior shows that people were choosing more adaptive investment portfolios.

5. Discussion

In general when looking across the models, we found that a positive set of intrinsic beliefs regarding the environment favorably influenced self-reported behavioral intention. A similar finding on the moderating effect of attitudes, subjective norms and perceived behavioral control on intention to perform environmentally responsible behavior is shown by Defrancesco et al. (2008). They found that a farmer's attitudes, beliefs and relationship with neighbouring farmers and their opinions on environmentally protective behaviors significantly affected adoption of agri-environmental measures. Further support for the moderating effect of attitudes, subjective norms and perceived behavioral control on behavioral intention can be found in studies looking at recycling (Boldero, 1995; Laudenslager et al., 2004) and public transport uptake (Heath

Table 4
Behavioral antecedents and demographic moderators.

			β	S.E	p	Predicted probabilities		
						Low	Medium	High
Behavioral intention	←	Attitudes towards Conservation	0.224	0.172	0.080**	0.001	0.952	0.991
		Subjective norms	0.393	0.264	0.036**	0.000	0.000	0.813
		Perceived behavioral control	0.403	0.229	0.016**	0.000	0.707	0.999
Attitudes towards conservation	←	y < $10	0.015	0.154	0.820	0.408	0.959	0.282
		Chief	0.105	0.352	0.207	0.261	0.822	0.433
		iTaukei	0.372	0.145	0.000***	0.127	0.468	0.630
		Female	0.026	0.148	0.694	0.399	0.955	0.290
		Farmer/fisher	0.047	0.191	0.515	0.374	0.941	0.313
Subjective norms	←	y < $10	−0.100	0.184	0.234	0.196	0.978	0.968
		Chief	0.009	0.402	0.925	0.133	0.934	0.983
		iTaukei	0.214	0.223	0.021**	0.056	0.707	0.995
		Female	−0.127	0.186	0.150	0.210	0.983	0.965
		Farmer/fisher	0.111	0.333	0.405	0.088	0.847	0.991
Perceived behavioral control	←	y < $10	0.101	0.218	0.296	0.609	0.222	0.849
		Chief	0.116	0.266	0.070*	0.509	0.101	0.901
		iTaukei	0.199	0.171	0.003**	0.502	0.095	0.904
		Female	0.192	0.144	0.003**	0.533	0.125	0.890
		Farmer/fisher	0.120	0.254	0.220	0.577	0.175	0.868

R2: Attitudes = 0.176; Subjective Norms = 0.092; Perceived Behavioral Control = 0.151; Behavioral Intention = 0.543
* p < 0.10.
** p < 0.05.
*** p < 0.01.

and Gifford, 2002) amongst others.

Behavioral intention was found to increase the probability of choosing more adaptive investments in the green incentive condition. This supports the TPB's assumption that intention, moderated by the aforementioned intrinsic variables, is the most proximal determinant of behavior. Deviating from our hypothesis, intention did not mediate subsequent stated behavior under dynamic and no incentive conditions. This could be an indication that the green incentive condition was able to engage deeper motivations to undertake adaptive behavior thereby supporting our hypothesis that green incentives strengthened intrinsic motivations. In agreement with our hypothesis we also found that the choice of adaptive over non-adaptive investments were greater under the green incentive condition. Thus, by using the framework of the TPB we were able to show that extrinsic incentives to facilitate the uptake of climate adaptive investments did not seem to crowd-out one's environmentally protective intrinsic motivations. As such, this study provides preliminary evidence to support the use of microloan incentives to facilitate the adoption of climate change adaptation behaviors.

To further explore the intention-behavior relationship we can turn to the literature on threat and coping appraisal. It is possible that the green incentive condition would have instigated threat appraisal by establishing a threat to future returns. The risks of income loss from non-adaptive investment outweighed the income gained via the adaptive option. The assessment of threat along with one's coping appraisal could establish one's investment decision. Coping appraisal consists of: a) response efficacy, or one's appraisal of the efficacy of the behavior in removing the perceived threat, which in this case is represented by investment options; b) self-efficacy or one's ability to actually carry out the behavior and lastly; c) response cost which is the assessment of the costs associated with carrying out your investment choice. As such following the introduction of the threat the green incentive condition could have also provided a reasonable solution to the threat through presenting a choice of investment options of which the more adaptive investment choices would have been the most desirable. From a decision theoretic perspective when faced with several options with similar expected returns, the optimal choice should be that with the lowest expected outcome variance (Hodgson et al., 2009).

Under the different incentive structures, it is reasonable to assume that one's investment decision could have yielded different cultural,

Table 5
No incentive coefficients and predicted probabilities.

			β	S.E	p	Predicted probabilities				
						Adaptive	Mod adaptive	Mixed	Mod non-adaptive	Non-adaptive
No incentive	←	Behavioral intention	−0.016	0.063	0.845	0.057	0.849	0.770	0.927	0.076
		Perceived behavioral control	0.000	0.000	999.000***	0.037	0.874	0.796	0.906	0.066
		Control treatment	0.108	0.212	0.244	0.031	0.672	0.560	0.807	0.123
		y < $10	−0.083	0.128	0.123	0.078	0.913	0.856	0.962	0.055
		Chief	−0.045	0.457	0.670	0.120	0.967	0.940	0.988	0.089
		iTaukei	−0.482	0.234	0.000***	0.293	0.999	0.998	1.000	0.002
		Female	0.023	0.131	0.689	0.031	0.679	0.568	0.812	0.062
		Farmer/fisher	−0.011	0.183	0.874	0.002	0.064	0.035	0.136	0.004
		Access to credit	0.091	0.224	0.252	0.034	0.710	0.602	0.835	0.139
		Current microloan	−0.392	0.218	0.000***	0.232	0.997	0.993	0.999	0.010

No Incentive R2 = 0.231; Mod = Moderately.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

Table 6
Dynamic incentive coefficients and predicted probabilities.

			β	S.E	p	Predicted probabilities				
						Adaptive	Mod adaptive	Mixed	Mod non-adaptive	Non-adaptive
Dynamic incentive	←	Behavioral intention	−0.058	0.039	0.195	0.051	0.926	0.872	0.948	0.048
		Perceived behavioral control	0.000	0.000	999.000*	0.037	0.874	0.796	0.906	0.066
		Control treatment	0.210	0.197	0.006**	0.011	0.489	0.366	0.558	0.155
		y < $10	0.062	0.070	0.019**	0.026	0.792	0.691	0.838	0.090
		Chief	0.016	0.246	0.752	0.008	0.981	0.960	0.987	0.187
		iTaukei	−0.532	0.147	0.000***	0.356	1.000	1.000	1.000	0.002
		Female	−0.027	0.130	0.590	0.037	0.925	0.870	0.947	0.067
		Farmer/fisher	−0.045	0.154	0.368	0.473	0.041	0.020	0.059	0.001
		Access to credit	0.159	0.183	0.006**	0.013	0.498	0.374	0.567	0.142
		Current microloan	−0.179	0.181	0.010**	0.120	0.965	0.932	0.976	0.017

Dynamic incentive R2 = 0.231; Mod = Moderately.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

Table 7
Green incentive coefficients and predicted probabilities.

			β	S.E	p	Predicted probabilities				
						Adaptive	Mod adaptive	Mixed	Mod non-adaptive	Non-adaptive
Green incentive	←	Behavioral intention	−0.187	0.072	0.022**	0.346	0.972	0.937	0.986	0.012
		Perceived behav control	0.000	0.000	–	0.229	0.731	0.596	0.818	0.027
		Control treatment	0.241	0.283	0.027**	0.065	0.369	0.239	0.482	0.125
		y < $10	0.055	0.198	0.447	0.048	0.969	0.933	0.985	0.158
		Chief	0.101	0.276	0.067*	0.061	0.582	0.434	0.690	0.131
		iTaukei	−0.525	0.196	0.000***	0.573	1.000	1.000	1.000	0.002
		Female	−0.020	0.179	0.764	0.771	0.016	0.006	0.032	0.000
		Farmer/fisher	−0.038	0.259	0.651	0.235	0.852	0.749	0.909	0.026
		Access to credit	0.018	0.376	0.880	0.203	0.716	0.578	0.805	0.033
		Current microloan	−0.155	0.319	0.196	0.296	0.968	0.931	0.984	0.016

Green Incentive R2 = 0.412; Mod = Moderately.
* p < 0.1.
** p < 0.05.
*** p < 0.001.

monetary and reputational outcomes. In the no incentive and dynamic incentive conditions, with no prompting of environmental considerations, investment decisions could be weighted by risk taking behavior, with monetary outcomes perhaps being the foremost focus to maximize utility of a choice. In contrast the framing of the green incentive condition could have elicited a different balance of monetary, cultural and reputational outcomes such that it could have guided ones optimal choice towards the adaptive investment option.

Under prospect theory the framing of a problem would impact the heuristics people employ in subsequent decision making. Tversky and Kahneman (1981) have shown that how we present choice-problems can significantly impact outcomes. Framing the same decision problem in different ways can elicit very different responses. In the current study by drawing attention to the environmental impact of one's investment decision in the green incentive conditions could have influenced subsequent decisions.[18]

It was also found that ethnicity and particularly being iTaukei had a significant effect on outcomes and intrinsic motivations regardless of incentive type. Indigenous Fijians had a higher probability of having positive attitudes, subjective norms and perceived behavioral control. In addition they had greater probability of choosing the more adaptive over non-adaptive investments. Returning to threat appraisal, for iTaukei the land and sea are deeply entwined into their sense of personal and cultural identity as evident in concepts like Vanua. The latter refers to the intimate relationship people have with the land and sea (Crosby, 2002; Bricker and Kerstetter, 2006) which very much takes on a more holistic 'community of beings' worldview (Gadgil and Berkes, 1991). Here, humans are not seen to have dominion over the land, the sea and the species which populate it, but are seen as inextricably linked. Perhaps, it is this intimate relationship that draws iTaukei towards adaptive investments when given the opportunity as it possibly poses the least threat to their cultural identity. The elicitation of emotional responses through concepts such as Vanua could also incline people to adaptive investment options as it would enable them to protect their heritage. That iTaukei were more inclined to opt for adaptive investments may be promising in generalising green incentives to other Small Island Developing States (SIDS), especially in Polynesian islands and their outliers where similar folklores and associations with the land and sea exist (Thaman, 1994).

We found that subjective norms were influenced positively by farm and fishing related occupations, whilst the effect was not as strong for perceived behavioral control and attitudes towards conservation. The effect of occupation on subjective norms is not surprising. Subjective norms after all consist of our perceptions of referent others beliefs

[18] The 'framing effect' has also been shown to be susceptible to emotional stimuli (Mano, 1994; Druckman and McDermott, 2008). Cognitive neuropsychological studies have found that the Amygdala, a key part of the brain associated with emotional responses, is active in mediating decision biases (Adolphs, 2010; De Martino et al., 2006; Seymour and Dolan, 2008; Dolan, 2007). The questions related to the TPB could have primed emotional responses to subsequent investment choices.

regarding a specific behavior. As farmers and fishers are reliant on the land and sea for their livelihoods they can be expected to be more aware of climatic changes, and thus have more vocal opinions on how to behave in the face of such changes. That these groups believed it was important to protect their ecosystems is promising for conservation in Fiji and is evident in their traditional practices (Nainoca, 2011). We also found the probability of adaptive over non-adaptive investments was greater for farmers and fisher folk in the dynamic and green incentive conditions. For these groups, the least costly choice would have been the adaptive option, as it provides the opportunity to safeguard against the potential loss of income in the immediate future and protects livelihoods in the long run.

Indo-Fijians formed the majority of the remaining ethnicity group. They were less likely to choose the adaptive investment regardless of loan condition. Looking at agricultural livelihoods in Fiji, Indo-Fijians predominantly are sugarcane farmers who work on leased lands (Narayan and Prasad, 2003). For this group perhaps the nature of land as lease-hold gives them less of an incentive to conserve the resource and more of an incentive to seek profit maximization wherever possible. Regardless of occupation, in Fiji using marine and land resources often requires permission from the indigenous landowner (Trnka, 2005) which could influence their perception of responsibility for future upkeep of the resource. In addition, whilst iTaukei live in village communities, Indo-Fijians often live in extended families. In the former it may be that responsibility for a resource is shared amongst the community and may go beyond financial concerns whilst in the latter it may be that the locus of responsibility is predominantly focused on the needs of the family system.

We found that females and village heads had a higher probability of positive perceptions of behavioral control. In Fiji women are very involved in the management of natural resources and have a rich tapestry of traditional ecological knowledge which may influence their control perceptions. Similarly for village heads, as stewards of the land and sea, their ability to control resource use in their qoli qoli and land are reflected in their positive perceptions of behavioral control. Interestingly however when presented with a green incentive village heads had a negative correlation to stated adaptive behavior – such that the probability of choosing non-adaptive portfolios was greater than for adaptive. Whilst the following effect was not significant, for women, under the green incentive condition the probability of choosing adaptive portfolios was the strongest predictor of behavior, with the probability of choosing adaptive loans being 0.771. This may suggest that targeting women to take up adaptive investment behaviors through green incentives could be beneficial.

When looking at the frequency distributions of investment choice, we found that adaptive investments were chosen most often regardless of incentive type and lending model. The decision model that was offered to participants could be seen as decision making under risk (Damghani et al., 2009). This implies that there is a level of uncertainty present and an inability to entirely control outcomes of one's investment choice. The element of risk introduced in the experiment was climate. The climate variable impacted investment returns. In the no incentive condition, the riskier mixed and non-adaptive investments would have yielded greater returns more often. Looking at the simplest form of decision making under risk – which assumes rationality, we would expect respondents to have used the information at hand to assign subjective probabilities to each investment choice under each climate event. It is assumed that a respondent would accept that investment which would maximize expected payoff – in this case: the mixed loan.

That the adaptive investment was chosen most often across all conditions does raise the concern of response bias. It could be assumed respondents chose the adaptive loan as they were primed to answer in an environmentally responsible manner considering that the survey preceded the experiment. Whilst response bias is always a threat, an alternative explanation could be, that adaptive loans, which provide the opportunity to conserve ecosystems (most directly through the provision of mangrove seedlings) and protect livelihoods, incorporate other values. As such the choice of adaptive loans would go beyond monetary profit making decision rules and elicit a wider set of rules that are non-pecuniary in nature. Moral reasoning is also a consideration. With the possibility of the adaptive loans, our conception of the difference between right and wrong, and our understandings of justice may be engaged. As Kristiansen and Hotte (1996) state, “for moral actions, the nature of the self and the moral issue affect the process of moral reasoning and thereby value-attitude behavior relations” (p.77). With strong cultural ties to the land and sea Pacific Islander's may have a stronger moral connection to the natural world.

Considering this, the choice of adaptive loans across all conditions could also indicate a protective mechanism against cognitive dissonance. Cognitive dissonance describes the cognitive discord, which arises through holding two or more conflicting beliefs. According to Festinger (1962) we strive to minimize disharmony that arises through holding conflicting attitudes and beliefs as it leads to psychological discomfort. Therefore those who were less inclined to taking risks and/or more inclined to environmentally protective behaviors, perhaps because of cultural norms, would have been more attracted to adaptive loans regardless of the loan condition.

Whilst under prospect theory, the choice of adaptive loans could also be an indication of future profit maximization and present loss aversion. This is in essence supporting the view that indigenous people, and in particular pacific islanders, are ‘natural conservationists’. For their societies to survive, small indigenous communities with a reliance on natural resources would have developed a culture of conservation as a measure to avoid loss (Johannes, 2002). This is evident in their traditional practices, most perceptibly in those practices related to marine conservation. Further commenting on loss aversion, the sampled population was largely represented by the poor. For such a population Tversky and Kahneman (1986a, 1986b) found that losses are weighted in a different manner, with all existing choices being between losses. The least costly choice is thus the most attractive. Perhaps we can find an example of loss aversion in our findings and particularly in the observation that iTaukei had a higher probability of choosing adaptive investments over non-adaptive across conditions whilst also displaying a greater positive affiliation with the natural world. For iTaukei the adaptive choice could be the most attractive regardless of condition because in the long run it would be the least costly, protecting their cultural heritage and future yields whilst also reducing any stress that may arise through cognitive dissonance. In essence for this population adaptive loans may be seen as a self-protective mechanism (Li et al., 2012).

A current microloan increased the probability of adaptive portfolios in the absence of incentives. Whilst under dynamic incentives access to microcredit had the opposite effect. This positive effect of a current microloan on adaptive investment choice could indicate that being in receipt of a current microloan gave people the confidence to engage in investments which take into account their future income and livelihood security over short-term coping strategies. This may be supported by a study by Mosley (2001), which, looked at a small sample of rural and urban microfinance institutions in Bolivia. Overall, he found that the microfinance institutions had a positive impact on income and asset levels with poor households opting for low-risk, low-return assets, which delivered longer term income security.

That access to microcredit increased the probability of choosing moderately non-adaptive investment portfolios only under the dynamic incentive condition would benefit from further investigation. It may be that access to credit can help to insulate consumption patterns from income variability from shocks by allowing households to take on more risky but profitable activities as was the case in the dynamic incentive condition. Within individual lending models, dynamic incentives have been shown to increase risky behavior. Wydick (1999) found that such behavior could be mitigated through group lending. As such a future

Table 8
Covariance coefficients.

			β	S.E	P
No incentive	↔	Dynamic incentive	0.207	0.091	0.023**
		Green incentive	0.361	0.061	0.000***
Green incentive	↔	Dynamic incentive	0.264	0.047	0.000***
Attitudes towards conservation	↔	Subjective norms	0.354	0.096	0.000***
		Perceived behavioral control	0.381	0.063	0.000***
Subjective norms	↔	Perceived behavioral control	0.031	0.074	0.670*

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Table 9
Matrix of correlations.

		1	2	3	4	5	6	7
1	Attitudes towards conservation	1						
2	Subjective norms	0.403	1					
3	Perceived behavioral control	0.453	0.071	1				
4	Behavioral intention	0.565	0.512	0.532	1			
5	No incentive	−0.15	−0.08	−0.11	−0.12	1		
6	Dynamic incentive	−0.25	−0.16	−0.18	−0.22	0.389	1	
7	Green incentive	−0.29	−0.21	−0.22	−0.32	0.492	0.543	1

direction could be to further investigate the incentive conditions under a properly designed joint-lending experiment.

Another important observation was that in the absence of information (the control treatment), the probability of non-adaptive investments was greater. This was only true though for the green and dynamic incentive conditions. It may be that these incentive structures presented a more cognitively demanding decision process. In order to simplify the decision process using the available information on returns could have weighted the non-adaptive investments as more attractive. When presented with information on climate change, the respondent's judgment of utility is repositioned by attention weights. Assuming that beliefs have intrinsic value, Golman and Loewenstein (2015) show, information can shift focus of attention and thus preference for certain choices. They show how attention weights can specify how much a person is thinking about particular beliefs and, in turn, how much those beliefs directly impact utility. This also harkens back to Bénabou and Tirole (2003) and the notion that imperfect-information regarding one's own ability can be a factor in deciding whether to pursue a task with short-term costs and long-run payoffs.

This study has its limitation. First, as a true experimental method was not employed, we cannot infer causality. In addition the administration of the survey instrument came before the experiment that could have primed people to a certain response. The validity of self-reported data is also a concern. In addition, the small sample size does limit statements of generalizability. The survey experiment suffered from a major failing – that of ordered effects. The study failed to randomly rotate the incentive conditions. People were presented with the no incentive condition, when they had made their investment selections under that condition, they were presented with the dynamic incentive followed by the green incentive conditions. Subsequent analysis could mitigate this by rotating conditions. However Auspurg and Jäckle (2012) show that there is variability on the presence of ordered effects in choice experiments, with some showing strong effects through fixed designs (see Table 8).

An additional limitation is that of learning effects. By presenting people with two loan periods under each condition, they were able to learn from their first investment decision and use that to inform the next. However this could have been potentially mitigated by the presence of the random weather variable. This ensured that respondents were unaware of the returns they would get in each loan period.

Furthermore the design of the incentive conditions makes it unclear as to what component of the green incentive is attributed to the uptake of adaptive investments. It could have been a) the information provided on the impact of investments on the ecosystem, b) the positive reinforce of the partial grant for adaptive investments, c) the negative reinforce of higher interest rates for mixed and non-adaptive investments, d) or a mixture of all of these components. The solution would have been to design three more incentives which teased apart points *a* through to *c* which would have allowed for a control against the confounding effect of the combined incentive structures represented in the green incentive condition.

Despite this, it still provides useful insights. Overall, the finding that the green incentive condition did induce people to take up adaptive investments more so then other loan conditions is promising. The uptake of adaptive technologies and behaviors, which protect ecosystems, were incentivized by converting the loan into a partial grant. This is similar to Wetlands International's 'Bio-Rights' model (Kaiser et al., 2005) however it differs in key ways. Firstly the loans can be made to individuals over groups, secondly it does not require complete buy in from the community, and thirdly enforceable property rights do not limit it. In collectivist communities with strong subjective norms like those in Fiji (Van Deusen, 2009; Nainoca, 2011), the adoption of green loans by one member within a village may be sufficient in driving others to do the same. Indeed in communities with a strong established desire towards conservation (as perhaps indicated in Fiji with concepts such as Vanua and the widespread use of locally managed marine protected areas (Veitayaki, 2000)) microloans with green incentives are useful in getting people started with adaptive measures (see Table 9).

To conclude, the case study of Viti-Levu highlights the dynamics present in the uptake of climate change adaptive investments. To the best of the authors' knowledge, it is the first study to look at cognitive drivers of microloan uptake in a field setting. We found that cognitive drivers are correlated with behavioral adoption, which is reinforced further by incentive schemes. For Governments and conservation agencies' alike, this finding can help better devise lending conditions and adaptation initiatives. Merging environmental conditions into lending portfolios can be a cost effective way of reaching conservation and development targets in conjunction. Through replicating the study in different contexts one can better assess its generalizability. However in the Pacific SIDS context in particular it is probable the findings will hold as these microstates share a similarity in regards to their geospatial, socio-political, and economic characteristics as well as their connection to the ecosystems, which they inhabit.

Appendix A. Supplementary Data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ecolecon.2018.08.015.

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